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REPORT ON COLUMBIA RIVER POWER PROJECT NEAR THE DALLES, OREGON.

BY L. F. HARZA

ELECTRICITY IN PUBLIC SCHOOLS.

BY L. A. McARTHUR.

REGULATION OF PUBLIC UTILITIES HAS MADE COMPETITION UNNECESSARY AND UNFAIR.

BY GEO. L. MYERS.

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Alphabetical Index to Advertisers, Page 8 Where to Buy It in the West, Page 9

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REPORT ON COLUMBIA RIVER POWER PROJECT

NEAR THE DALLES, OREGON

(Continued.)

BY L. F. HARZA

Plan of development. The proposed plan of development as shown in Fig. 7 anticipates the construction of a dam across the narrow neck at the head of Five Mile Rapids; a deep channel across the bench to the right provided with large gates to be opened in time of flood; a canal with intake adjacent to the flood channel and following the right, or Washington side of the river to a power house located on Big Eddy about one and one-half miles below.

Plate III. View of the Damsite, looking Upstream.

Dam. A view of the damsite looking upstream is shown in Plate III. The construction of a dam to close this present river channel is an undertaking which, within its class, is unprecedented in magnitude. Several schemes which have been suggested for accomplishing this end are discussed in detail in Appendix F, some being based upon the use of a loose fill of rock or other material and others upon the construction of a solid concrete dam.

The loose fill schemes are all based upon the belief that loose rock of ordinary sizes or of any size likely to be obtained from the excavation, would be carried away by the current if dumped in such a

gradual manner as to subject them to overflow. Of these schemes one contemplates the piling up of several hundred thousand yards of loose rock adjacent to and on each side of the river. This rock would be retained by a high rubble or reinforced concrete retaining wall which would be destroyed by a blast at the beginning of a low water season, thus precipitating the mass of rock into the river and entirely blocking the channel to a sufficient height to divert the river through a bypass channel previously excavated for that purpose. In another scheme a concrete arch would be constructed across the river, and working from this a mesh or screen of large chains would be built and anchored upstream, allowing it to bag downstream underneath the arch, thus preventing the escape of the rock as gradually dumped. A third method provides for the dumping gradually of long reinforced concrete needles or logs in a position parallel with the current, which because of their shape, position and small exposed area would be little affected by the current. A fourth method provides for the gradual placing of loose rock in large bags made of a mesh of chains, each bag when filled weighing from 25 to 50 tons.

Of the two proposed methods for constructing a concrete dam both provide for driving a tunnel under the river, and the sudden removal of its roof by a blast after having prepared in the tunnel a seat for a tight masonry dam, for the details of which the reader is referred to Appendix F.

After this the gorge might be filled with concrete for a total thickness, measured longitudinally of the channel, of about 200 ft. This solid concrete-fill would be a base on which would be constructed the flood control gates that would extend across the entire stream. The concrete fill would be placed in still water after the first closure had been effected. Two methods of effecting the closure are detailed in the technical Appendix F.

Among the above methods at least two of the loose fill schemes are believed to be feasible from an engineering standpoint. They in general use a material (loose rock) of which a vast surplus is available and which must otherwise be wasted. Although unprecedented in magnitude, yet no previously unapplied principles of construction are involved. A solid concrete dam if feasible would, however, provide a wide enough crest to permit the construction of the flood gates entirely across the valley with consequent reduction in depth of control and site of gates. This latter purpose is important and may ultimately warrant the adoption of some one of the types of concrete dam described in Appendix "F," notwithstanding their possibly greater cost, more delicate problems of construction and the comparative lack of precedent to aid in their solution.

Flood control gates. As stated in a previous paragraph, a flood of 1,400,000 second feet, which is 20 per cent greater than the estimated maximum recorded flood of 1894, has been assumed for the design of the controlling works. It has also been assumed, in the interest of riparian owners above, that the works must provide for passing a flood of this magnitude without exceeding the elevation of the 1894 flood (or 148.6) at the damsite. This leaves a drop from the river level above the damsite to gages 2 and 3 (see Fig. 7) where the flood channel returns to the river of only 7 ft. for discharging this water.

With the available fall thus limited and with the present narrow channel closed with a loose fill dam not adaptable to overflow, thereby restricting the width of the waterway now available, the bottom of the flood channel would need to be at elevation 70.0, which means a controlled depth of 81 ft. at low water. If, however, a concrete dam with flood gates along its crest identical with those used elsewhere could be built across the gorge the length of flood gates would be so increased as to permit the bottom of the flood channel to be raised to about elevation 90, thereby reducing the controlled depth to only 61 ft. at low water. This channel depth is also subject to reduction, as discussed elsewhere, in view of a permissible reduction of the maximum flood to be accommodated.

The construction of gates to control a depth of either 60 ft. or 80 ft. is a problem which, within its class, is unprecedented in magnitude. There is precedent, however, for the plan of closure of a channel 50 ft. in depth, as in the case of the emergency dam in front of the lock gates of the Panama Canal. As the problems which were met in that case approach the closest, of any known to have been solved, to those which govern the design of controlling works for this project, the general principles there used were adopted as a basis for the first scheme studied in detail for this investigation. It has been designated on the general layout, Fig. 7, as a "Camere Dam," after the name of the first engineer to use it (in the Port Villez dam in 1876-80). This dam consists of steel plate-girders hinged at one end from a bridge and with the other end arranged to be swung down into the current to a seat in the bottom of the channel; the upstream flanges of these girders would be provided with rails down which gates rolling on lubricated trucks would be lowered. The girders would be built and hinged in pairs with necessary interbracing to prevent their lateral deflection. This scheme is described in more detail in Appendix G.

A study was also made of the practicability of using a large tainter gate reversed from its usual position, and closing an opening 81 ft. deep and 80 ft. wide the same as closed by one unit of the Camere gates. This gate is also without precedent for structures of its class. Both types of gates require the use of large steel members, although many larger ones can be cited in modern bridges where the uncertainties of loading are probably greater than in this case. The two types represent opposite extremes in the sense that the Camere gates accomplish the subdivision of the dam into many comparatively small units for ease in operation but at the expense of simplicity in the operating program, while the tainter gate gains simplicity in operation but only by the use of an immense and heavy structure. Both designs, especially the Camere, as it was started first, have been carried to such a point as to solve the main fundamental problems of design in order to assure one of their practicability,

but details of structural members coming within the field of established precedent have not been studied. Such members have been assumed for estimating purposes merely by their loading and an assumed unit stress.

Subsequent to the design of these structures it has been shown, as discussed in Appendix B, that a flood of 1,400,000 second feet is an exceedingly remote possibility and one would have been justified in designing the controlling works for a smaller flood, requiring a controlled depth of only 67 ft. instead of 81, and a bottom elevation of sill of 84.0 for the rock fill dam; or a controlled depth of 51.5 ft. and bottom elevation of 99.5 for a concrete dam with superimposed gates. This reduction in depth would greatly simplify and cheapen the controlling structures, but time was not available for a re-design.

Canal. The canal would originate on the Washington side, as now proposed, and would follow the right bench to Big Eddy about one and one-half miles. It would have a bottom width of 325 ft., with depth of water of 81 ft. On the river side would be built a rock fill wall, as shown in Fig. 7, lined on the inside with concrete to prevent leakage, and on the weep-holes outside up to high water elevation to prevent erosion by the river.

Powerhouse. The generating station would be located on the Washington shore of Big Eddy. It would have a length of about 1670 ft. and a width in the generator room of about 76 ft. Due to the shape of the shore line one bend in the powerhouse would be necessary. The angle thus formed would be used as space for offices and for any other convenient purpose. The S. P. & S. Railroad would be carried across the forebay and tailrace on bridges and through the powerhouse in an arch at a point close to the bend. Throughout most of the length the draft tubes, which would be built below the level of Big Eddy, would be constructed in an excavation made behind the protection of a wall of natural rock at the water's edge left undisturbed during the excavation. At one place, however, a deep but narrow bay of Big Eddy would be crossed and a cofferdam in a depth of about 75 ft. of water would be required.

The water would enter the powerhouse (see Fig. 8) from the forebay through a trash rack or screen, consisting of flat steel bars on edges and spaced about 4 in. on centers; from here it would flow through a gateway capable of being closed by a large rolling gate to shut off the water from the turbines; thence through a curved passage or penstock to a spiral case formed in the concrete; thence through the guide vanes of the turbine and through the runner to the draft tube in which its velocity would be reduced until discharged into the tailrace with practically no remaining energy.

Machinery. The plan proposed in this report anticipates the installation of 23 main generating units each consisting of a turbine runner capable of developing about 60,000 horsepower, at the lower end of the vertical shaft, and driving a 25 or 60 cycle, 11,000 volt, electrical generator at a speed of 75 revolutions per minute with a normal rating of 35,000 kilowatts at the upper end of the shaft. The turbine runner, shaft the generator rotor would be supported by a Kingsbury thrust bearing resting upon a spider on top of the frame of the generator. The weight of the turbine runner would be about 150 tons, of the generator rotor about 250 tons and of the entire rotor about 600 tons. The shaft would have a length of about 80 ft. in three pieces and a diameter of about 37 in. with an 8 in. hole through the center. The turbine runner at the band and the entrance to the draft tube would be nearly twenty feet in diameter. The generator stator as shown in Fig. 8 would have a diameter of about 44 ft.

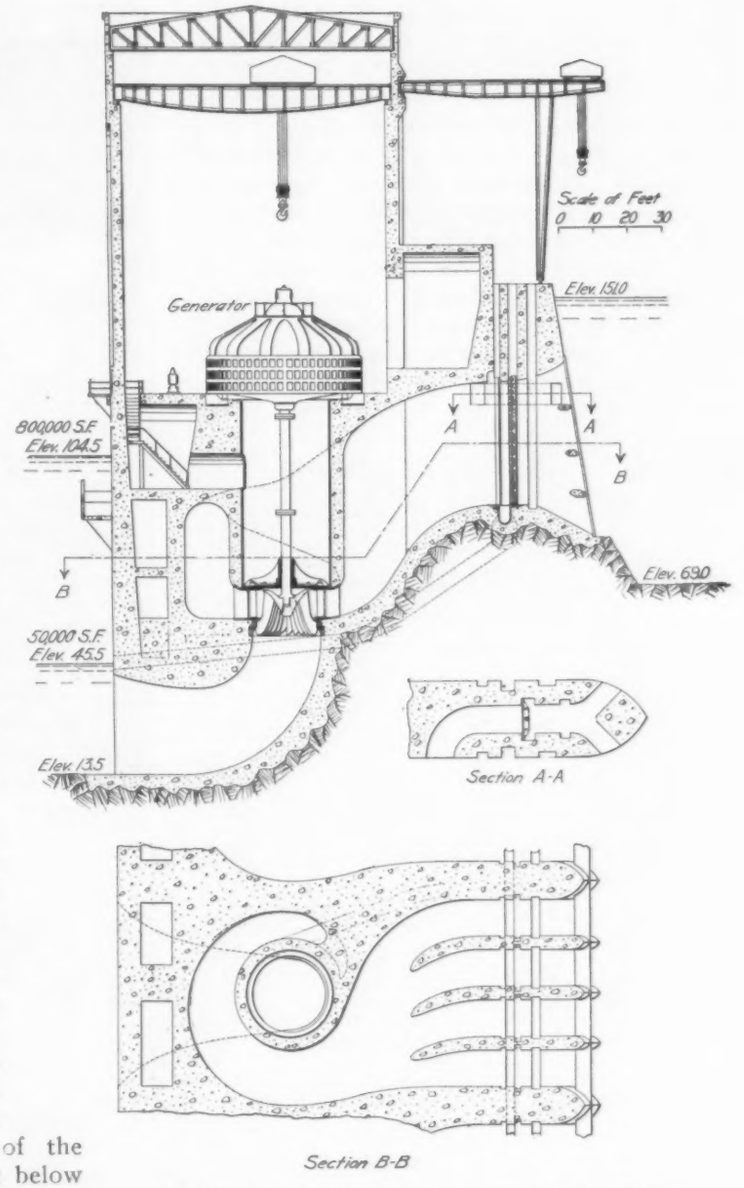
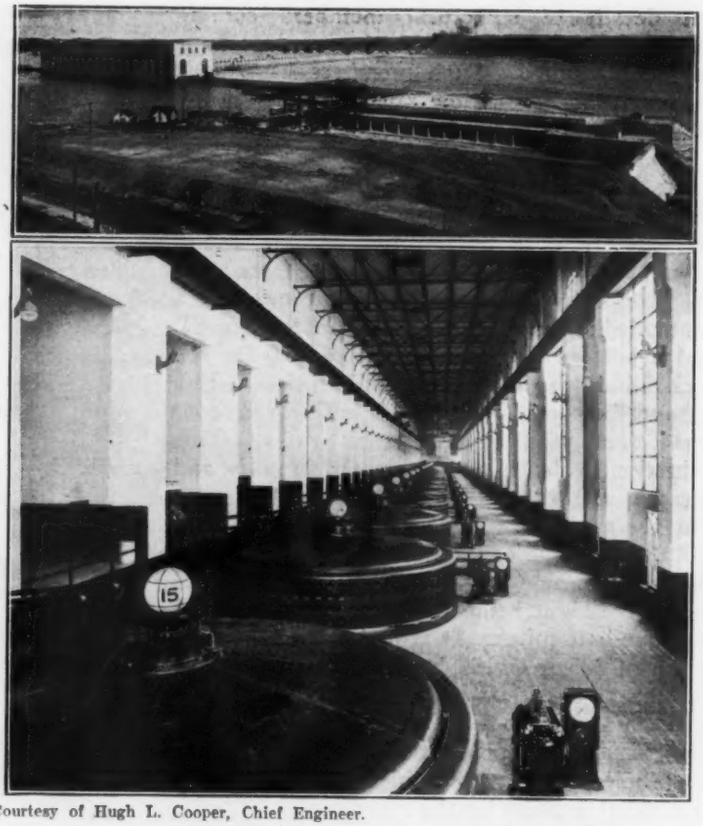


Fig. 8. Proposed Cross-Section of Generating Station.

Comparative size. The proposed station would have a capacity far in excess of any other single station yet constructed. The nearest approach thus far is the plant of the Mississippi River Power Company at Keokuk, Iowa. An exterior view of this development from the Iowa shore and an interior view of

the powerhouse are shown in Plate IV. The generating station as shown contains 15 vertical units and will ultimately be increased to 30 units, of a type similar to those proposed for this project. Each turbine develops 10,000 horsepower under a head of 32 ft. by means of a runner shown in Plate V, which has a diameter at the band of 17 ft., and was cast in a single piece. The greatly increased power of the runners proposed for this project is due partly to this increase in size but more especially to the greater head under which they would operate. The appearance of the interior of the powerhouse would be much the same as shown in Plate IV. The dam is visible in the upper view extending in the distance to the Illinois shore with a length of 4800 ft. In the foreground is a dry dock and a lock.

[To be continued.]



Courtesy of Hugh L. Cooper, Chief Engineer.

Plate IV. View of the Development of the Mississippi River Power Co. at Keokuk, Iowa.

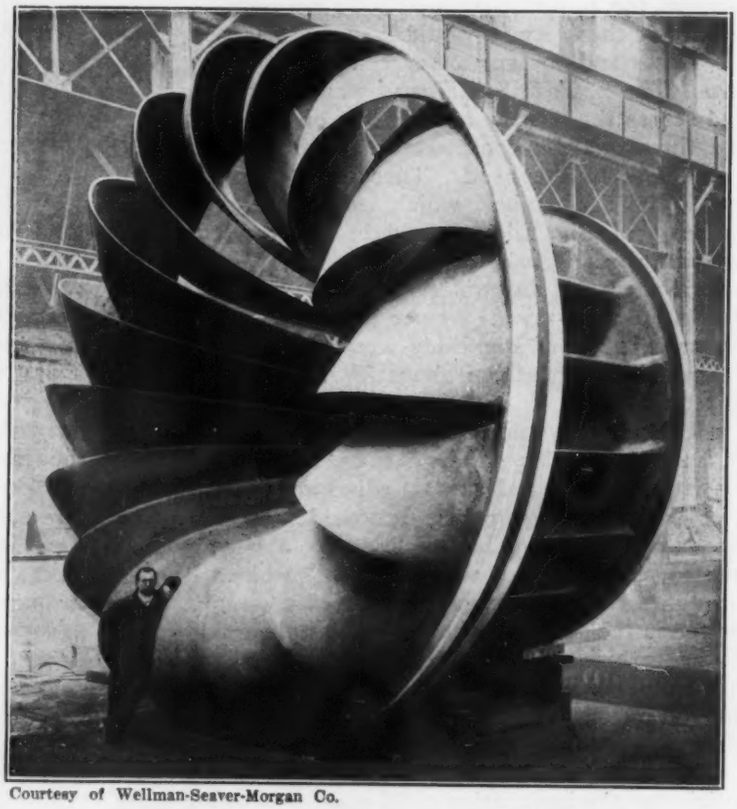
Interior View of the Keokuk Generating Station. Similar in Interior Layout to the One Proposed at The Dalles.

UTAH USES ELECTRIC POWER IN ROAD BUILDING.

Electricity has not been considered available for use on movable equipment, especially if any considerable distance were covered in a day, owing to the expense of changing service connections. The Utah Power & Light Company has solved this problem by mounting portable substations on wagons for contractor's use. Each substation is equipped with 1000 ft. or more of secondary cable which can be paid out as needed, thus supplying a range of 2000 ft. without a change in location of the substation. If the contractor has enough electrical equipment to warrant, he employs an electrician who is also competent to make primary connections to the power company's lines.

The State Road Commission of Utah, of which E. R. Morgan is engineer, is using an electrically equipped tractor concrete mixer in the construction of six miles of concrete roadway between Salt Lake City and Murray. The roadway is 16 ft. wide and 6½ in. thick and is laid on a rolled gravel sub-base which had previously been put in. A one-half yard cube mixer equipped with a 15 h.p., three-phase motor, is used. Nine hundred and fifty lineal feet of roadway, requiring 305 cu. yd. of concrete, are laid in an eight hour day with a current consumption of 121 kw. hours, or 0.4 kw. hour per cu. yd.

The roadway is kept flooded with water for about three weeks after it is laid, water for this purpose being pumped from ditches with a motor-driven, triplex pump. Three inch pipe is run out for a distance of 1500 ft. on each side of the pump, furnishing water for the mixer as well as for flooding.



Courtesy of Wellman-Seaver-Morgan Co.

Plate V. View of the Runner of a Keokuk Turbine. Those at The Dalles Would Be Considerably Larger.

The development of wireless telephony seems destined to greatly stimulate the development of wire telephony, by extending the region into which the service of the wire plant can be given.—F. B. Jewett.

ELECTRICITY IN PUBLIC SCHOOLS.

BY L. A. McARTHUR.

(This interesting account of how the young idea is taught to do it electrically in Oregon and Washington tells of the electrical equipment of several schools, with particular reference to electric cooking. The author is assistant general manager of the Pacific Power & Light Company at Portland, from whose bulletin the article has been taken.—The Editor.)

One of the interesting features of the recent convention of the Northwest Electric Light & Power Association, in Portland, was the invitation extended by Mr. L. R. Alderman, superintendent of the Portland public schools, to the delegates to the convention to inspect the various manual training and domestic science departments under his charge. Mr. Alderman stated that the school officials as a rule are anxious to receive helpful suggestions from utility operators who are familiar with the more modern uses of electrical energy in education. Mr. Alderman thought a great deal of good could be accomplished by the schools and utilities co-operating in using better methods of household work.

In order that the various members of the Pacific Power & Light Company's system may be familiar with what is being done at the several branches, an effort has been made to present substantial statements showing the extent to which company service is being employed in educational matters. The article which follows demonstrates that there is an extensive field of usefulness for electrical energy in the small public schools as well as in the large. The school girls of today will be the housewives of tomorrow and just in proportion to their knowledge of electrical cooking will they continue to use that method. Also, it may be stated that the boys who are learning manual training in schools today may some day be shop foremen, superintendents or owners, and their knowledge of electrical machinery will surely result in the increased use thereof.

The Prosser public schools are good electrical customers. For some time the company has served them with electric power and illumination and recently they have added a domestic science department as a customer for electrical cooking. A 50 Hughes range has been installed, repacing four small coal oil stoves, and is used by an enterprising class of sixteen. The range is giving satisfaction in every particular.

Domestic Service Department, Astoria, High School. Electricity in Public Schools.

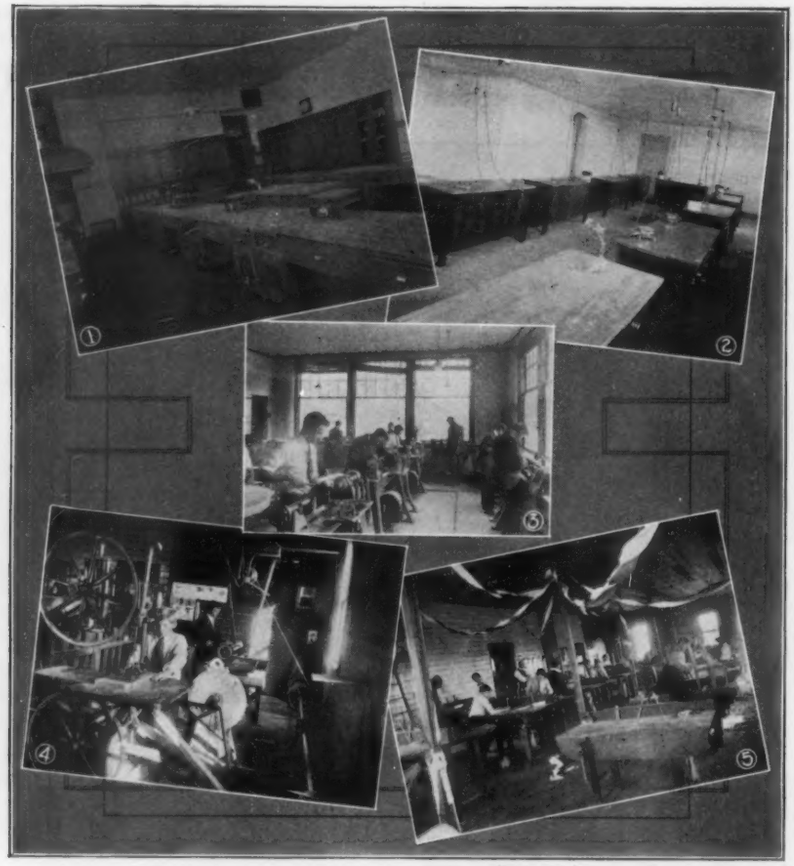
The manual training department is fully equipped with lathes, circular and band saws, planer and bench equipment. This department is located in an old school building near the high school building and the second floor is fully equipped with a modern vacuum process fruit canning plant. The school children marketed 40 tons of canned fruit from this department last year. All power used in the manual training and fruit canning plants is furnished by a 5 h.p. three-phase Westinghouse motor.

The Riverview school, in which the grammar grades are located, is equipped with a modern Sturtevant ventilator system propelled by a 7½ h.p. Hawthorne motor. All the air in the entire building is changed every ten minutes. This building is equipped with a modern lunch room where hot soups and baked potatoes are served the children during the lunch hour. In the near future we expect to install an electric range for use in this department.

The school system of Astoria, consisting of one high school and five grade schools, is a fair consumer

of electrical energy, although the high school, which is a large and up-to-date school, uses the greater portion of the energy.

In this school, work has been carried on in some of the more practical branches, such as domestic science and manual training. In the domestic science department, there are installed 12 6-inch G. E. 3-heat stoves and one No. 2 Copeman electric range,



1. Domestic Science Laboratory, The Dalles High School. 2. Home Economics Department, Sunnyside High School. 3. Manual Training, Pendleton High School. 4 and 5. Manual Training at Grandview School.

which are used by a class of nine pupils at present and will be used by another class that is now forming. This installation has been in use for the past three years and has been giving good satisfaction from both a monthly cost basis and maintenance standpoint.

A great deal of interest is shown in the manual training department which was added during the latter part of last term. As yet no power has been installed but provision has been made therefor and the building wired for approximately 40 h.p. in small motors, of which possibly 10 h.p. will be installed during the coming term.

In addition to the above, the science department uses gas in the laboratory for its work. A 15 h.p. motor is used for ventilating and heating purposes. All the schools are wired and use light, as well as the four night schools. A 5 h.p. motor is used in one other school for heating and ventilating.

During the fall of 1913, the school board of The Dalles decided to put in a domestic science department in the local high school, and although a complete equipment of oil stoves was ordered, by working through the city superintendent of schools, the domestic science instructor and various members of the board, the company succeeded in having the order cancelled and electric equipment substituted.

The superintendent was at first opposed to electrical apparatus, contending that he had tried it elsewhere and found it a failure, but upon questioning him it was learned that he had used 600-watt disc stoves which did not heat fast enough to do the work necessarily limited to forty-minute periods. The company recommended 8-inch, 1500-watt disc stoves and by a practical demonstration was able to convince him that they would do what was required, with the result that the company sold ten General Electric single disc, 1500-watt stoves and two standard General Electric Type D-1 ovens, having a demand of approximately 2 kw. each. In addition to this, several flat irons have been installed and a fan driven by a ½ h.p. motor to carry away fumes and smoke. The school's officials have expressed themselves as being pleased with the results obtained.

The manual training department of the high school has a number of machine tools, such as planers, shapers, mortising machines, circular saws, etc., which are driven by a 10 h.p., 3-phase, 220-volt motor belted to a main line shaft. This shaft, however, is located in the basement under the shops, and as each machine is driven by an individual belt through the floor, very few pulleys or belts are in sight and those that can be seen are protected by guards with the idea of safety first always in mind. Two General Electric 2-quart, electrically heated glue pots form part of the equipment of this department. The enrollment for this year shows 156 pupils registered for work in this department.

Electrical power is generally used in the Pendleton public schools, there being eight motors installed in the high school shops. The large circular saw in the stock room is driven by a 5 h.p. motor and the jointer in the same room by a 3 h.p. motor. In the general shop three motors of ½ h.p. each are attached to three separate lathes, while the remainder of the lathes are operated by a 5 h.p. motor. In the center of the shop a ½ h.p. motor is attached to the oilstone grinder.

Under the direction of the manual training instructor, the boys of the high school are constructing a building in which will be installed 12 forges with one motor exhaust, and an additional motor will be attached to the emery grinder.

Superintendent A. C. Hampton states that the electrical power is satisfactory for the very good reasons that it can be depended upon at all times and is much more convenient than any other power. For instance, the motors are all supplied with a spring

switch either for the hand or foot and the boys learn to apply the power almost unconsciously.

Besides the above mentioned electrical equipment in the manual training department, the large ventilating fans in each of the three ward schools and the high school are driven by electrical power. In fact, for all the mechanical appliances where motive power is needed the electrical power is used, and as the domestic science department grows it will be the purpose of the administration to install the different electrical equipments for cooking purposes.

At Waitsburg, Preston Hall, donated to the city by Mr. Preston of the Preston-Shaffer Milling Co., has a manual training room which has an equipment of seven 2½ h.p. wood lathes. In the girls' department, there are seven oil stoves and one steel range. The pupils number about 150. Only 27 of this number take the higher course and use the equipment.

At Pomeroy, the use of electricity in the domestic science department is confined to one 6-inch dics stove and one electric iron.

One year ago, Sunnyside school directors placed in the high school course of study lines which they thought would bring the student closer to the commercial world; namely, home economics, manual training, agriculture and commercial work. The home economics department is very well equipped, especially electrically, having 20 6-inch General Electric 3-heat disc stoves.

Grandview has had manual training for two years in the schools and this year has 46 boys enrolled in this course. They have a well equipped shop, among other appliances being a turning lathe, band-saw, etc., driven by a 2 h.p. motor. Here, every new piece of work requires a drawing before it is made. The boys also bring in considerable repair work from the farms, such as shovel handles, tables, chairs, etc. This gives them the practical application.

The North Yakima high school has installed a small rectifier, taking 110-volt, alternating current from the city lighting circuit, and transforming it into direct current at any low voltage desired to be used in the study of telegraphy, electroplating, electrolysis, etc. School officials state that the rectifier is far superior to the old battery system. The mechanical laboratory also has installed a 1 h.p. motor, direct connected to an exhaust fan to carry the chemical fumes away from the laboratory. The school also has a small projection lantern fitted with the customary arc lamp and using energy from the regular lighting system.

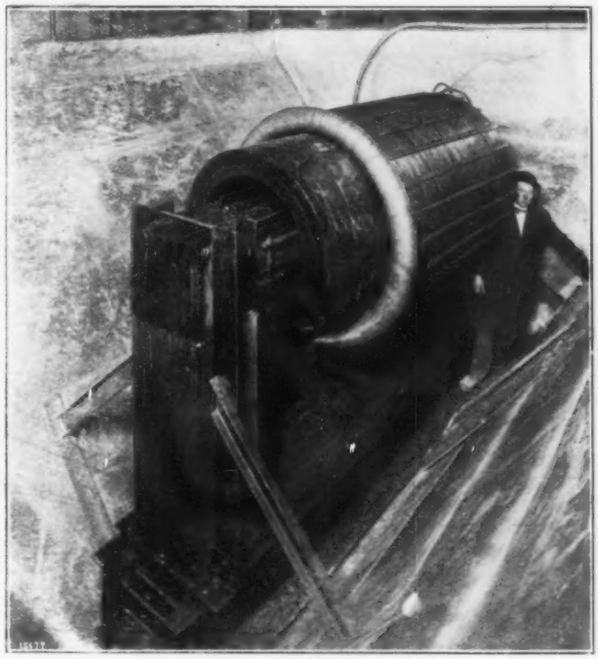
The Hood River Gas & Electric Company advises that the Hood River high school has not yet an extensive manual training department as there is not sufficient building space available. The school uses Hughes hotplates in the physics laboratories in a limited way. The principal of the schools has a movement on foot for a new high school building, which will contain complete electrically operated domestic science and manual training departments, and which, it is hoped, will be erected next summer.

Heat in sawdust piles to be used for fuel is due to fermentation and can be reduced my sprinkling the pile with an antiseptic solution such as one part of mercurous bi-chloride in 5000 parts, by weight, of water.

A MILLION VOLT TRANSFORMER.

BY A. S. LINDSTROM.

The installation of the 1000 kw. million volt transformer was completed at the Panama-Pacific International Exposition November 1st. The transformer was designed and built in the laboratory of Mr. C. H. Thordarson of Chicago at a cost of $30,000. This cost includes the specially made machinery for winding the low and high tension coils and the insulating tube. It required a year and a half in the laboratory and when finally designed only thirty days building the same in the factory. This transformer has the highest voltage of any yet built.



A Million Volt Transformer.

The transformer is submerged in 225 bbl. of oil in a specially designed cement pit with metal lining. The air surface at the oil line measures 16 x 18 ft. This high grade insulating oil was loaned by the Union Oil Company of California to the Exposition.

The weight of the transformer is approximately 30,000 lb., and it is made up of 26,000 pieces of paper, fibre, aluminum, copper, steel and iron and designed to develop 1000 kw. at 60 cycles. Under ordinary conditions this transformer will develop 2000 kw. for 24 hr.

The low tension coils of this transformer are wound to receive 2200 volts and are made up of 122 coils arranged in multiple series, the coils being bridged in pairs across the 2200 volt terminals. This allows for a neutral tap which is grounded to the transformer frame.

The paper tube which insulates the primary and secondary coils weighs over 2000 lb. The million volt circuit is made up of 190 coils, each coil being 5000 volts, equally spaced and wound with flat aluminum, 8 mill, 1 ampere conductor insulated by three paper. All coils are connected in series with one end grounded.

There are 400 miles of paper, aluminum and copper used in the construction of the coils and paper tube, 90 miles of aluminum and 270 miles of paper being used in winding the million volt coil.

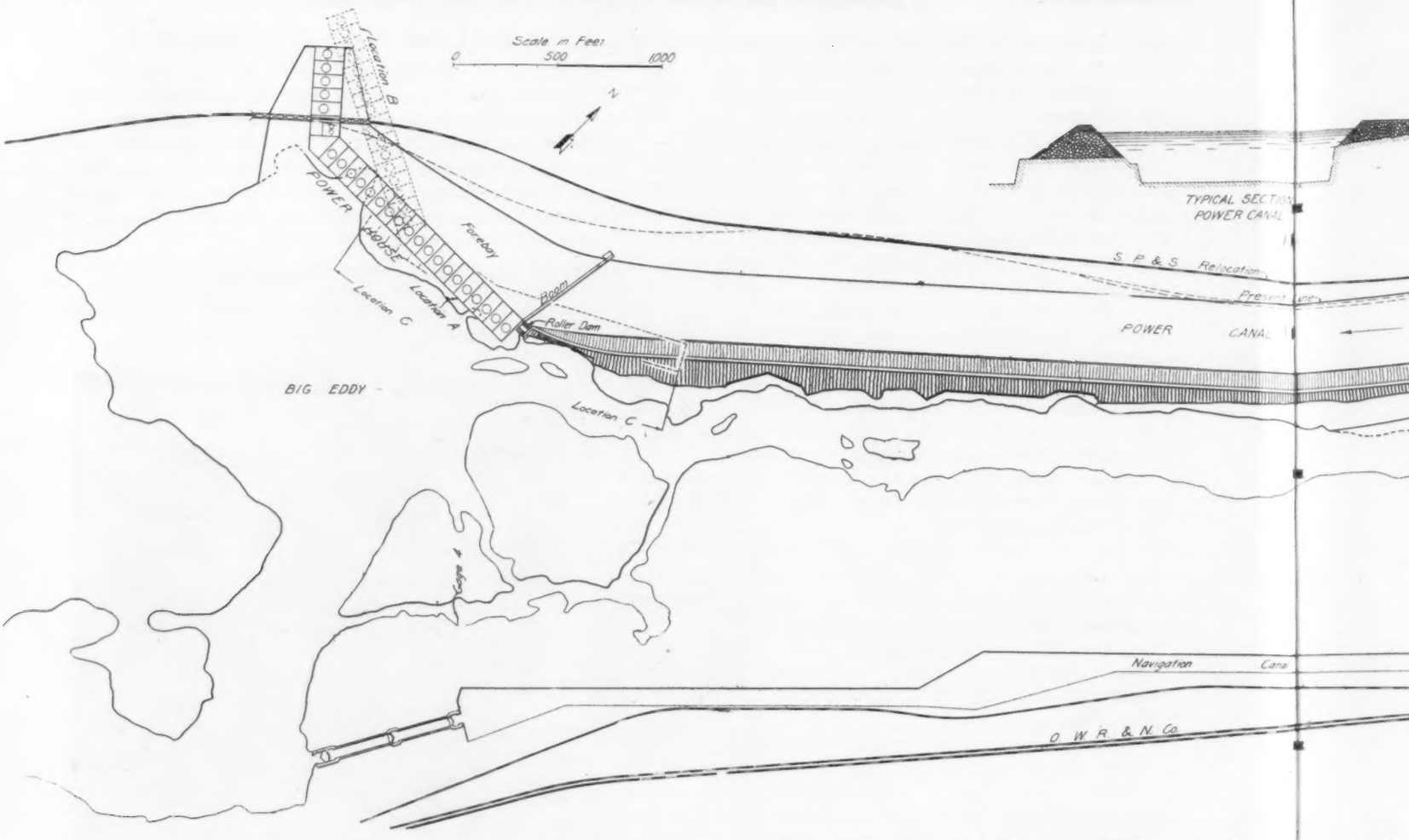
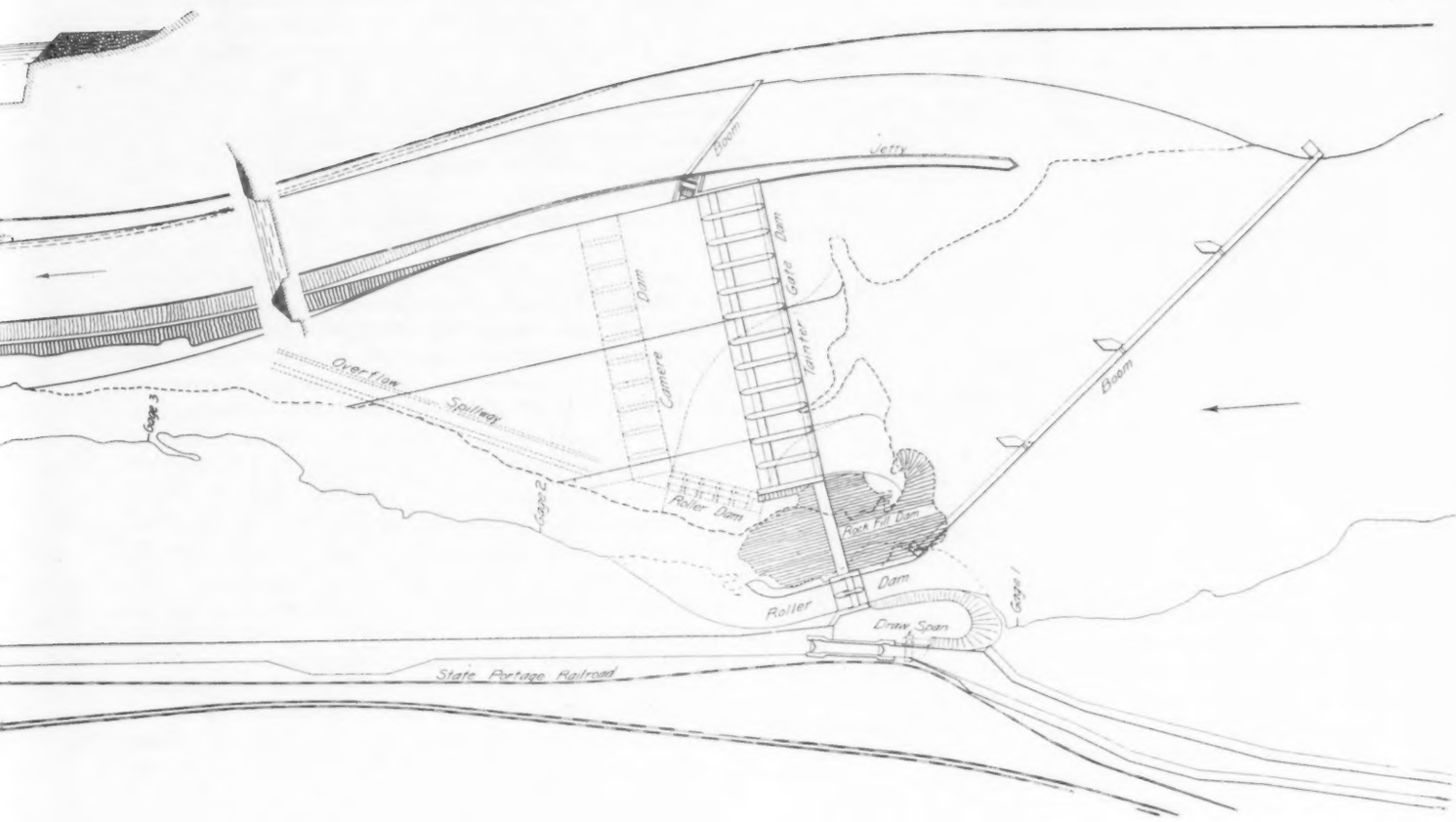
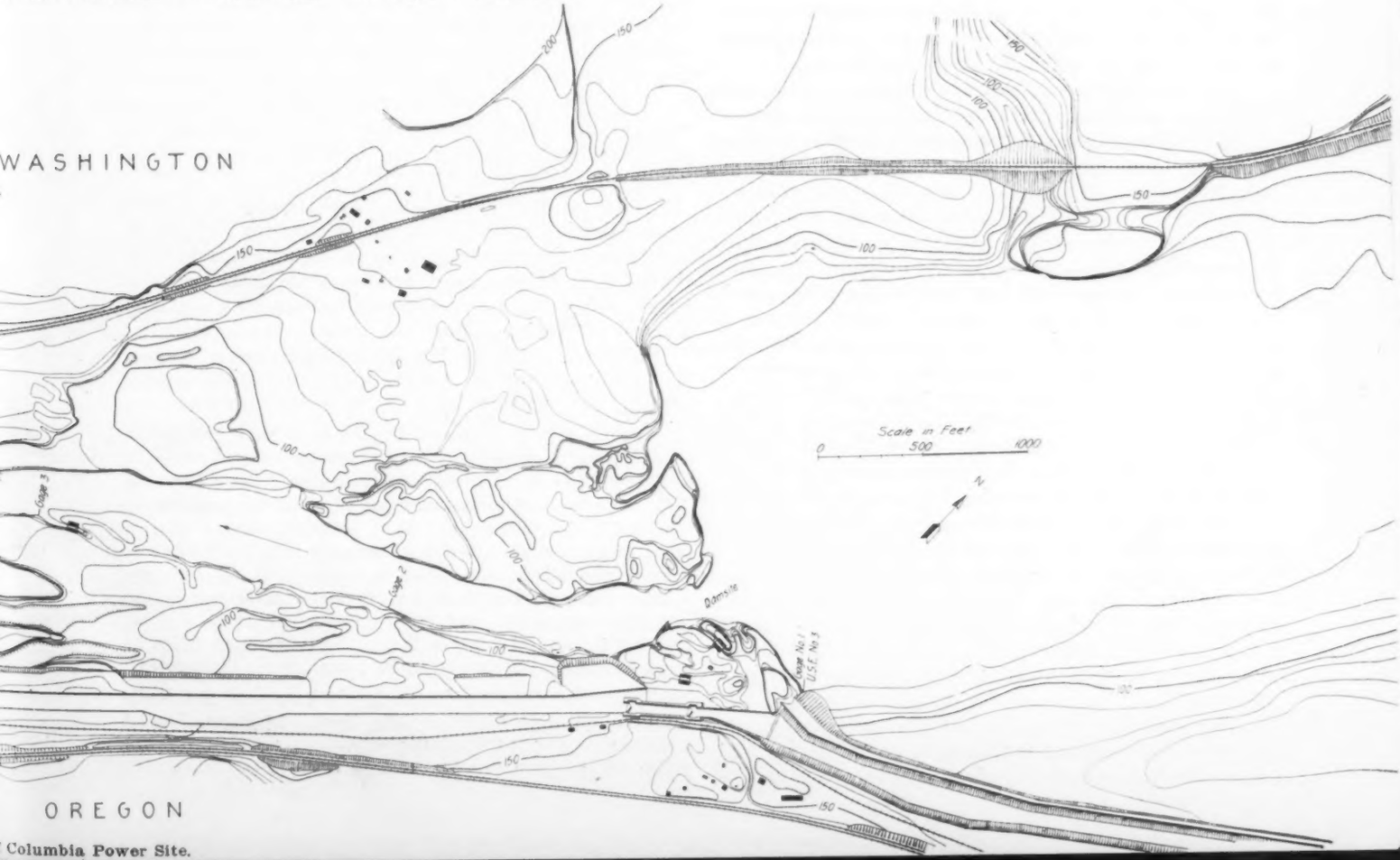


Fig. 7. General Layout of Proposed Development, showing Alternative Lo

Fig. 9. Topographic Map of Columbia Po



ternative Locations of Power House and Types of Flood Gates.



Columbia Power Site.

REGULATION OF PUBLIC UTILITIES HAS MADE COMPETITION UNNECSSARY AND UNFAIR.

BY GEO. L. MYERS.

(Reasons are here given for delegating to public service commissions the power of regulating competition. The author is assistant secretary and treasurer of the Pacific Power & Light Co. at Portlond, Ore. —The Editor.)

Thirty-four states of the Union have public service commissions. Fourteen other states have railroad commissions. Utah is the only state that has neither a public service commission nor a railroad commission. In other words, thirty-four states regulate all public utility corporations, fourteen regulate common carriers and one state has no regulation. Of the thirty-four states having public service commission statutes sixteen of them provide that the commission shall have power to protect existing public utilities from competition, and the District of Columbia likewise has such a provision in its statutes. It is especially interesting to know that of these thirty-four states those which have had greater experience in regulation of public utilities give their commissions this power. Of the nine states of the West having public service commissions, namely, Arizona, California, Colorado, Idaho, Montana, Nevada, Oregon, Washington and Wyoming, four of them, namely, Arizona, California, Idaho and Wyoming, provide for regulation of competition. At the last session of the Washington legislature a statute was enacted giving the public service commission this power but it has been referred to the people by referendum petition for decision at the forthcoming general election in November, 1916. During the last session of the Idaho legislature an unsuccessful attempt was made to repeal that portion of the public utility statutes providing for freedom from competition by rule of the commission.

The old-time theory that the functions performed by a public utility company, the character of its service and the charges demanded were the principal contour of the public utility only and its own business has been denied by an intelligent and aroused public opinion. The result of this awakening has been the regulatory laws of the various states. The old arrogant "public be damned" policy is no longer the policy of any public utility cognizant of its real duty to the public, and, if it were, it could be no permanent policy because of the powers exercised by the state in defense of the public's rights. The public utility has come to recognize that its service is a public service, susceptible of intelligent regulation in the public utility's interest as well as that of the public, and that the people have been justified in demanding regulation because of the natural monopolistic aspect of the service. Monopoly is power, and it is irresponsible unless effectively regulated by a superior power, and without effective regulation such irresponsibility gives rise to arbitrary acts that are detrimental to the party whose practices become arbitrary, and thus necessitates regulation as preferable to limited socialism in the form of public ownership with all the blighting influences of partisan politics.

The growing recognition of the fact that public utilities are monopolies is the result of experience and a more intelligent understanding of public utility economics. Promiscuous competition has proved not only burdensome to the utility surviving competition by compelling it to increase its investment through an acquisition of the property of its competitor, but has produced ill-effects to consumers, in that they have been obliged to pay increased rates for service, or forced to continue payment of rates prevailing before the advent of competition that might otherwise have been reduced with increased consumption and greater earning capacity.

If an existing public utility is to be subject to strict regulation on the one hand and to indiscriminate and wolfish competition on the other, has regulation done all that it ought to do in justice to the public, the investor and the management of a public utility? Where public authorities have no discretion as to the justification for competition, and a competitor enters a field well served, with the result that competition proves to be only temporary and consolidation necessary in order to realize a reasonable profit, because the market for electrical energy is too restricted to divide the revenue, who is responsible for such a mistaken policy? Certainly the public utility that survives is not responsible for such a policy. Therefore, if the consolidated company goes to the commission with a request that it be given a reasonable return upon its investment that is increased by acquisition of a competitor and is denied that return the act is an injustice in that the burden of a mistaken and unwise policy is to be borne not by those responsible for that policy, but by the company that is the victim of such policy. If there be a denial by the proper public authorities of a fair and reasonable return upon a fair and reasonable value of the property as determined by such authorities because the increased investment compels higher rates to consumers, is there not an analogy between such an act and a contention that there is justification for an inadequate and unfair return because there are more consumers affected than there are investors? In other words, the decision need only be predicated upon the fact that there are more purchasers of the power than there are sellers.

That competition is uneconomic as applied to public utilities is avowed by many well known authorities and progressive thinkers. The following extracts from the opinions of some are therefore of particular interest because they are the convictions of men who speak as a result of careful study, observation or experience:

Woodrow Wilson, President of the United States, in an address before the students of the University of California in 1911, said:

"Public service corporations are in a very interesting sense natural monopolies. They generally use the pieces of land and roads and highways which are most convenient for their purposes, and most direct for effecting the communication which they effect; and it is perfectly obvious that if other companies are allowed to compete with them there is a wasteful duplication in outlay and equipment, so that competition generally results in an eventual combination of the competing companies and the necessity to charge a price on what they supply that will pay the interest on twice as great an investment as was really necessary for the service."

John H. Roemer, formerly chairman of the Railroad Commission of Wisconsin, in an address delivered September 4, 1913, entitled "Commission Control of Public Utilities," stated:

"That public utilities are virtually monopolies by nature and must be dealt with as such in any just and comprehensive system of state regulation is the fundamental economic principle upon which the law was constructed. Without protection of such monopolies only a limited and inadequate supervision of their affairs by public authorities can be morally justified. At the very foundation of the Wisconsin system lies a uniform indeterminate franchise, denominated 'an indeterminate permit,' which gives the corporation a legally protected monopoly."

Halford Erickson, member of the Wisconsin Railroad Commission, in an article entitled "Regulation of Public Utilities in Wisconsin," in Public Service for May, 1913, wrote as follows:

"It is recognized by the railroad and public utility laws of Wisconsin that public service corporations are in their nature monopolies and that the interests of the public are best conserved by protecting monopoly in these industries and at the same time supervising and regulating them in the public interest. To carry out this purpose, competition among public service companies in the establishment of new lines and plants is prohibited, except under such conditions as make its existence a benefit to the public."

"It is only in very exceptional cases that a commission could be justified in admitting competition among public utilities in a municipality, for the waste in equipment and other inconveniences generally more than offset all benefits to be derived."

Charles R. Van Hise in his work entitled "Concentration and Control," says:

"Industries in which the element of natural monopoly enters are likely to become concentrated. Here are included the public utilities."

Balthasar H. Meyer, member of the Interstate Commerce Commission and formerly chairman of the Wisconsin Railroad Commission, made the following statement on competition, which is interesting not only because it is the utterance of a member of the Interstate Commerce Commission, but also because it is a statement which shows that the issue was deemed settled by experienced men as far back as 1911:

"There are few things which the industrial history of advanced nations proves more conclusively than that competition in the field of public utilities has failed to insure reasonably adequate service at reasonable rates. The public has had occasion to learn this lesson many times and on a large scale. * * * Certainly we have had enough repetition of disasters to the public as well as to investors to lift this subject out of the field of controversy, but somehow these lessons must not have been on a sufficiently large and overwhelming scale, for the fetish of competition is still being worshipped and the cry of competition is still raised by many as the touchstone capable of dissolving every obscure entanglement which strained relations between the utilities and the public sometimes create."

The Supreme Court of the United States, recognizing the monopolistic nature of public utilities, said in the case of Wilcox vs. Consolidated Gas Co., 212 U. S. 19 (1909):

"In an investment in a gas company, such as complainant's the risk is reduced almost to a minimum. It is a corporation which, in fact, as the court below remarks, monopolied the gas service of the largest city in America, and is a cure against competition under the circumstances in which it is placed, because it is a proposition almost unthinkable that the city of New York would, for purposes of making competition, permit the streets of the city to be again torn up in order to allow the mains of another company to be laid all through them to supply gas which the present company can adequately supply."

The question will be one of the important issues in the general election in the state of Washington next year. Inasmuch as the Public Service Commission possesses ample powers to regulate service and limit rates to a reasonable return upon the capital invested it ought to have ample powers to protect an investment honestly made and limited in what it can earn in order to prevent a duplication of investment to render a service requiring one-half the investment and thus make possible lower rates rather than higher rates and eliminate economic waste by reason of an unnecessary investment of capital, which, in this intensely commercial age, is in great demand and should work with the greatest possible efficiency in our industrial development.

Accidents in electric power stations are mostly due to causes common to all industries, only 15 per cent being caused by electricity. Most of the electrical accidents are burns due to carelessness in handling switches or by bringing tools in contact with live apparatus. These may be largely avoided by wearing tested rubber gloves in working on low-voltage apparatus and furthermore by using a 10 ft. wooden pole and standing on a rubber mat when doing high potential switching. All non-insulated high tension conductors should be inclosed by screen guards and should be designated together with all switches and other apparatus on a diagram posted in a conspicuous place so that employes may become familiar with it. Guard rail protection shoud be provided for all moving and electrically charged parts as well as all stairways and elevated gang-ways about them.

Solving the potash problem by new methods have recently been brought to the attention of the Bureau of Foreign and Domestic Commerce. One of the most promising of these efforts to find a substitute for German fertilizers is a patent taken out a few weeks ago by a Canadian for a method of using the potash in ordinary feldspar. The process is a simple one, consisting of heating the feldspar with limestone and iron oxide at a temperature of about 2200 degrees Fahrenheit, which produces a partly fused mass that is easily decomposed by a weak acid. From this product the potash salts can readily be extracted for further purification. The inventor has been in consultation with Dr. Norton, the expert who has been looking after the potash and dyestuff situations for the Bureau of Foreign and Domestic Commerce, and it seems very possible that a greatly simplified method of transforming feldspar into fertilizer will soon be available. A practical try-out for another method of obtaining potash fertilizer will soon take place at a New Orleans distillery where molasses is used in large quantities. It is a fact that 106 tons of potash are wasted daily by the 25 or more distilleries in this country that subject molasses to processes of fermentation. The New Orleans company is planning to install the process of saving the potash in distillery waste recently brought to the attention of the public by the Bureau of Foreign and Domestic Commerce. It should be possible to make fertilizer from this otherwise worthless material at a price that will meet competition even after the war is over.

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CONTENTS

Report on Columbia River Power Project 387
By L. F. Harza.

Utah Uses Electric Power in Road Building 390

Development of Wireless Telephony 390

Electricity in Public Schools 391
By L. A. McArthur.

Heat in Sawdust Piles 393

A Million Volt Transformer 393
By A. S. Lindstrom.

Regulation of Public Utilities Has Made Competition Unnecessary and Unfair 396
By Geo. L. Myers.

Solving the Potash Problem 397

Accidents in Electric Power Stations 397

Editorial 398
A Remarkable Sales Plan.
The Electric Player-Piano.
Scientific Emption.

Personals 400

Meeting Notices 400

Oakland Meeting of Electrical Contractors and Jobbers 401

Industrial 402
The Electric Tractor in Sawmill Service.
Wayne Toy Transformers.

News Notes 403

A Remarkable Sales Plan

What is believed to be the most comprehensive, intensive selling campaign ever conducted in any business will be started by the electrical men of Central California with the opening of Electrical Prosperity Week. The Pacific Gas & Electric Company has agreed to co-operate with the electrical jobbers and dealers in its territory by financing an installment payment plan on all lamp-socket appliances sold during the next fourteen months as the result of a series of special sales demonstrations to be carried on by the jobbers and dealers.

The central station's territory has been divided into seven districts, corresponding to the seven large electrical jobbing houses doing business in Central California. Each jobber is to have the opportunity of conducting a sixty days' sales demonstration in each district in rotation. That is to say, a demonstrating crew will be put to work by each jobber for a period of fourteen months while making the circuit of the seven districts, one jobber's force following up the crew of the preceding jobber.

In conjunction with this crew demonstration each dealer has the opportunity of carrying on a special sales campaign in his town, and because of the interest created will find that his sales can be greatly increased above normal.

The most noteworthy feature of this arrangement is the method whereby the consumer can buy an appliance on the installment plan at the regular list price of the device. Upon presentation of the signed order and the initial partial payment, the Pacific Gas & Electric Company will advance the full price of the apparatus to the agent making the sale and will thereafter assume the responsibility of collection. Furthermore a substantial bonus will be paid for each device sold, in addition to the regular salary of the demonstrator or the usual profit of the dealer.

This clever plan of action should be as effective in application as it is original in conception. At one sweep it clears away all the straw men which have been set up as antagonists to any endeavor to bring about a working agreement between the central station and the electrical dealer. In practice certain modifications in the preliminary plan may prove advisable but as regards the soundness of the underlying principle there can be no doubt.

Other central stations would do well to study the method in detail and be prepared to adapt its good features to their individual requirements. It represents the greatest single stride which has yet been made in any means of co-operative salesmanship and gives promise that the electrical industry is on the threshhold of an era of unequalled prosperity.

The Electric Player Piano

That the possibilities of the electric player-piano as a current consuming device are at last being realized is indicated by the interest which this subject is exciting in the Commercial Section of the National Electric Light Association. There is probably no device in the Home Electric at the Panama-Pacific International Exposition

which has elicited more favorable public comment than the electric player-piano there installed. Not only is the artistic execution superior to the foot-operated device, but also it can be installed on any existing piano without in any way marring it. The electric piano is but another argument in favor of doing things electrically in the home.

In introducing this device, as in introducing the electric vehicle or the electric cook stove, the co-operation of the electrical manufacturer and the central station is essential.

Strange as the statement may seem, the defects of motive power are more serious than any defect in mechanical construction of this device. With any variation in voltage the motor tends to become noisy, a serious drawback in this class of service. Voltage fluctuation also affects the speed of the motor and interferes with the quality of the music. This is a problem that can readily be met when the electric manufacturers realize the importance of the electric piano as an outlet for electrical apparatus.

The central station can materially assist the introduction of this current consuming device in the home by permitting the demonstration of its performance in their display rooms. When the public fully understand the pleasure to be had from this form of entertainment it should form a desirable source of revenue for power companies.

Scientific Emption

The importance of the selling half of a business transaction has completely overshadowed the significance of the buying half. So much attention has been given to the development of the salesman that there has been a tendency to neglect the training of the purchasing agent. Buying has been subordinated to selling, whereas they should be co-ordinated. Buying and selling are the complementary colors which give business satisfaction, just as a mixture of red and green produces white. There can be no sale without a buyer.

Consequently there seems to be a wide field of endeavor for the National Association of Purchasing Agents which was recently formed at New York City. It is of particular interest to note that N. L. Morse of the Southern California Gas Company at Los Angeles, is one of the directors and is active in extending the association's sphere of influence on the Pacific Coast.

Several praiseworthy objects may be accomplished by such an association, not the least of which is the promotion of friendly relations among purchasing agents and making them familiar with the recent advances in the art of buying and thus apply the experience of others to their own problems. For buying methods, particularly of public utilities and engineering organizations, have lagged but slightly behind the tremendous advance in selling methods. Progress has been steady, consistent, but silent.

Some judicious publicity is needed. Purchasing agents have been inclined to think that their success was dependent upon the number of secrets that they knew. Salesmen used to think the same. But upon investigation they found that other salesmen had just as many secrets and that by telling them to each other, all could profit mutually.

Buying is evolving from an art into a science. Isolated scraps of knowledge are being collected and systematized so that gradually there is being reared a structure of scientific emption just as there has been one of scientific salesmanship. "Emption," by the way, is an old word well adapted to new uses. It comes down from the ancient Roman times when "caveat emptor," let the buyer beware, was the first rule of business. Although now used but rarely, it seems preferable to coining a new word such as "buymanship."

The problem of buying has been greatly simplified by standard specifications for material. The purchasing agent can be greatly helped by data from such organizations as the American Society for Testing Materials and the Motor Car Builders' Association. Standard specifications from the engineering department are of material assistance in economical buying.

Assuming that the purchasing agent has proper specifications or requisitions from the engineering department, the next problem is to get the best prices and delivery on the quantity to be bought. It is necessary that he know where it is to be had, what is the present and prospective state of the market, and how it can best be delivered. He must be a good judge of human nature, of the ability of a seller to live up to his promises and of the costs of production. He has great opportunity to exercise native shrewdness in this respect. Above all else, the information should be systematized. A comprehensive, usable system is the first need of a purchasing agent.

The necessary qualifications are usually possessed to a marked degree by an engineer. This is a field of service, particularly in connection with public utilities, to which the engineer may well aspire, especially if he has had enough selling experience to be familiar with the ins and outs of the trade.

Scientific emption offers one of the best means for reducing the high cost of selling, and consequently is of particular interest to jobbers and other selling agencies. A high-grade purchasing agent is frequently more familiar with the material to be bought than the salesman. His knowledge is capable of being capitalized in reducing the cost of selling and therefore the cost of the material sold. For this class of man no amount of hypnotic persuasion is of as much influence in determining his action as are facts that can help him in his work.

This in no way, however, means the elimination of the salesman. While it tends to cull out that type of selling which has been inculcated by correspondence courses in salesmanship, men who learn a stereotyped selling talk by rote, it encourages that salesman who endeavors to be of real service to his client, informing him of the commercial side of the business and helping meet emergencies as they arise. The cordial and reciprocal relations which exist between buyer and seller can thus be promoted. There will never be a time when a good salesman will not be needed to help a good purchasing agent. And the purchasing agent who appreciates the help that he can gain from a salesman is more likely to succeed than is the "grouch."

PERSONALS

E. N. Fobes of the Fobes Electric Supply Co., Portland, Ore., is at San Francisco.

Frederick Jacobsen, a consulting engineer of Stavanger, Norway, is at San Francisco.

F. H. Leggett, Pacific Coast manager of the Western Electric Company, leaves for San Diego this week.

C. V. Schneider, electrical contractor of Sacramento, spent a few days during the week at San Francisco.

W. S. Herrick, electrical contractor at Sanger, Cal., spent a few days during the past week at San Francisco.

N. D. Powell, an electrical contractor of Stockton, Cal., spent a few days during the week at San Francisco.

W. E. Dorman, manufacturer of electrical commercial cars at San Leandro, Cal., recently spent a few days at San Francisco.

J. F. Ne Page, of the Ne Page, McKenny Company, electrical engineers and contractors, was a recent visitor at San Francisco.

Paul Morse, for some time past in the telephone business at Tuolumne, Cal., has resigned and is at present at San Francisco.

H. V. Carter, president of the Pacific States Electric Company, San Francisco, is on a business trip to Portland and the Northwest.

A. T. Berryhill of the firm of Larsen & Berryhill, electrical contractors of Ft. Bragg, Cal., spent a few days during the week at San Francisco.

S. B. Gregory, representative of the Arrow Electric Co., San Francisco, returned the first of the week from a business trip to southern California.

H. P. Monger, representative of the Hughes Electric Heating Company, Chicago, Ill., is at San Francisco during a business trip of the Pacific Coast cities.

S. T. Carr, sales engineer of the Hawaiian Electric Company, which firm represents the Westinghouse Electric & Manufacturing Company, is at San Francisco.

Allen Hazen, civil and hydraulic engineer of New York City, and **Leonard Metcalf,** civil engineer of Boston, are at San Francisco to give testimony on the physical value of the Spring Valley Water Company.

O. B. Coldwell, general superintendent of the Portland Railway, Light & Power Company, made an address at the University of Oregon, November 10, 1915, on the subject of "Rural Electric Service."

Chas. Eyman, formerly superintendent of the Central States Electric Company, Fresno, has purchased the electrical business of Sevier & McAdam at Visalia, Cal., and will make that city his future home.

K. A. Auhy, for some years assistant sales agent British Columbia Electric Railway Company, light and power department at Vancouver, B. C., has left that company and expects to leave shortly for England.

G. T. Prince, formerly electrical engineer of the Standard American Dredging Company, Oakland, Cal., has purchased the T. C. Electrical Works of Watsonville, Cal., and will continue the contracting work of that firm.

Robert W. S. Cox, sales manager of the National India Rubber Company, and **A. H. Emerson,** secretary-treasurer of the same company, who have been at San Francisco for some days, left the first of the week for Southern California.

K. Kurabayashi, of the Nippon Electric Company, Ltd., arrived at San Francisco during the week for a nine months' stay in this country during which time he will devote his time to the study of American business methods.

C. D. Hart, who has been in charge of the cable department of the Nippon Electric Company, Ltd., Western Electric Company's Japanese house and who is returning permanently to the United States, arrived at San Francisco the latter part of the week.

Frank Harris, for many years manager publicity department, British Columbia Electric Railway Company, Ltd., at Vancouver, British Columbia, has severed his connection with the company. Mr. Harris will take a much needed rest before undertaking any other business.

L. R. Jorgensen, consulting engineer at San Francisco, has returned from Gem Lake, Mono County, where he has been supervising the construction of two dams for the Pacific Power Corporation of Bodie, Cal. Mr. Jorgensen reports that the heavy snows have closed down the work for the season, and that it will take about three more months to finish the undertaking.

Paul M. Lincoln, whose term as president of the American Institute of Electrical Engineers, expired July 1, 1915, and who has for a number of years been prominently identified with the engineering department of the Westinghouse Electric & Manufacturing Company, has resigned his position with this company in order to be able to devote his time to the manufacture of a meter which he has recently invented.

H. M. Friendly of Portland, Oregon, will leave within a few days to accept a position with the Ohio State Telephone Company at Columbus, Ohio. Mr. Friendly's work will consist of special engineering investigation work. Mr. Friendly has been equipment engineer with the Pacific Telephone & Telegraph Company, and manager of the Northwestern Long Distance Telephone Company.

MEETING NOTICES.

Electrical Development and Jovian League.

The November 10th meeting of the League was Pacific Gas & Electric Company's day. One hundred and forty-three members being present, which sets the high water mark for attendance. Mr. Stanley Walton acted as chairman of the day, with Mr. John A. Britton, vice-president of the Pacific Gas & Electric Company, as speaker. Mr. Britton took for his subject "Gas," telling of its early manufacture and the present methods employed. Showed its efficiency as compared with electricity, the economy of its production and predicted that gas was only beginning to come into its own in the industrial world. In closing the meeting a hearty vote of thanks was given the speaker and the chairman of the day.

Jovian Electrical League of Southern California.

The weekly luncheon of the league, held at Christopher's Los Angeles, on November 10th, was attended by about 150 Jovians and their friends, who were treated to an exceptionally entertaining program. M. V. Simpson, having resigned as secretary on account of pressure of business, H. F. Keenan of the Southern California Edison Company, was named to succeed him.

Max Loewenthal then read the mayor's proclamation relative to Prosperity Week, which was received with applause, and it was voted to send the mayor a vote of thanks. Chairman of the day, Geo. O. Noble, then introduced Marjorie Carville, who entertained the diners with a delightful series of barefoot dances. An address was delivered by H. S. McKee, cashier of the National Bank of California on "The Federal Reserve Act and the Business Man," which act he called a study in efficiency. By means of a commonplace business analogy, the speaker gave a splendid and a most lucid explanation of the theory and practice of the act. He called the reserve bank a bank for banks, which affords relief to banks as banks do to their customers. It increases the banking power of the United States and will, no doubt, have a beneficent effect on our foreign trade. The bank can use

only self-liquidating paper and will make bank acceptances negotiable in place of two-name papers. In short, the credit creating power of the Federal Reserve Bank is enormous and it opens the door to financial liberty.

Portland Electric Club.

The bi-monthly luncheon of the combined Portland Electric Club and the local sections of N. E. L. A. and the A. I. E. E. was held November 11th at the Portland Commercial Club. It was announced that the plans for Electrical Prosperity Week were developing to the satisfaction of those interested and that the chamber of commerce was extending every material aid to the movement, in as much as they had made it possible to have two miles of cedar streamers placed on the streets and a new cluster lighting system installed.

The speaker of the day was Dr. A. E. Rockey, chief surgeon P. R., L. & P. Co., and he spoke on "The Engineering Side of Medical Practice."

He said, in part: A doctor is an engineer as he uses similar methods of analysis for solutions of medical problems. Problems in medicine are more obstruse than in electrical engineering and generally can not be solved by chemical analysis, but by very delicate reactions. People are more careful when it comes to handling of money than of life and know more about the subject, consequently demand efficiency. The people do not know that they do not know about medicine and consequently pass laws legalizing all manner of "witchcraft," causing a great deal of suffering which could be avoided by aiding the real science of medicine which is based upon a scientific analysis of facts.

Mr. O. B. Coldwell acted as chairman of the day. Attendance, 55.

The regular monthly meeting of the local sections of the N. E. L. A. and A. I. E. E., was held in the Portland Railway, Light & Power Company's auditorium Tuesday evening, November 9th.

Mr. Paul Lebenbaum presided as chairman.

A moving picture show was given and reels were shown giving "Schenectady Works of the General Electric Company" and "Back to the Farm." The paper of the evening was presented by A. S. Hall, manager Hood River Gas & Electric Company, on "Economic Construction of Rural Distribution Lines." The paper was discussed by Messrs. Broili, Coldwell, Merwin, Spaulding, Turley, Davidson and Easter. Attendance, 73.

Electrical Night at the Manufacturers and Land Products Show, Portland, Oregon.

November 8th was electrical night at the Manufacturers' and Land Products Show, and it was held jointly with the Retail Merchants' Association. A novel pyrotechnic display was made from the roof of the Pittock Block which was accomplished by the use of red fire, live steam and search lights. An electric vehicle parade was held in the evening. The machines being appropriately decorated.

The Portland electrical jobbing houses donated 12 electrical prizes which were given away by "lot" to the parties holding the lucky numbers.

In the motion picture theater films were shown of the Edison Lamp Works and the Schenectady Works of the General Electric Company also the Pittsfield works of the same company was shown. The Westinghouse Electric & Manufacturing Company also furnished several films of their plants. The retail merchants caught an itinerant peddler and sentenced him to death. The electrical men put him in an electric chair and electrocuted him in full view of the audience.

The general committee in charge of this work includes J. E. Davidson, A. S. Moody, Carl L. Wernicke, W. H. P. Hill, A. C. McMicken, Robert Skeen and George Boring. The special committee in charge of the electric vehicle parade is headed by W. R. Spalding, and includes A. N. Stanton, L. H. Reese and E. A. West.

OAKLAND MEETING OF ELECTRICAL CONTRACTORS AND JOBBERS.

An enthusiastic meeting of far-reaching importance was held by the electrical contractors and jobbers at Oakland on Friday night, November 12th. In many respects this was the most important meeting of contractors ever held on the Pacific Coast, as announcement was made of the new selling campaign on current consuming devices to be carried on in conjunction with the Pacific Gas & Electric Company. The meeting was attended by one hundred and twenty contractors, dealers, jobbers and central station representatives. It took the form of a dinner, over which Mr. Frank Somers of San Jose presided as toastmaster.

He first introduced C. E. Wiggin of Dunham, Carrigan & Hayden Company, who read a paper on co-operation and showed the benefits that will accrue from team-work between the contractor and jobber. His remarks were reinforced by an impromptu address from R. D. Holabird of the Holabird-Reynolds Electric Company.

W. S. Berry, sales manager Western Electric Company, than brought up for general discussion, the subject of a re-issue of a price list by the contractors' association. He, as well as C. C. Hillis and C. E. Wiggin, urged that such a price list represents an unnecessary duplication of the jobbers' price lists. They showed that it had been the cause of some disturbance in the business and argued that the prices given in the jobbers' catalogues are sufficient. On the other hand, C. F. Butte demonstrated the great value of the pamphlet previously issued, particularly in that it gave a legal standing for prices used in billing, in case of suit, and, furthermore, it condensed into compact form most of the information required by the contractor in figuring costs and in billing. This argument was reinforced by W. S. Hanbridge, who showed that the price list acted as a guide to the man who had an insufficient cost system or wrong ideas as to billing. In conclusion, R. D. Holabird suggested that the book carry no advertisements, as these become misleading within a few months after issue. He also suggested that the book be sold at a price of at least fifty cents.

The subject of Electrical Prosperity Week was then introduced by A. H. Halloran, who talked of the national plans of this campaign and detailed how it would be possible to tie in with it locally. He urged that all contractors use the material which would be supplied to them and participate actively in the campaign.

S. V. Walton, commercial manager of the Pacific Gas & Electric Company, then explained the plan for a campaign to put current consuming devices on the lines of his company by a scheme of co-operation between the company and the contractors and jobbers. Full details of this plan appear elsewhere.

L. H. Newbert, sales manager Pacific Gas & Electric Company, explained that it was his intention to call on every contractor and dealer in the territory and personally discuss the details of the campaign so that it would be clear to all.

W. L. Goodwin, general sales manager of the Pacific States Electric Company, showed that his big plan gave tangible evidence of the cash value of membership in the contractors' association. He explained that the expense of selling would be borne largely by the jobbers, but that the financing of the installment payments would be taken care of by the central station. He also urged the co-operation of the contractor in influencing a favorable public opinion toward the central station and defending it against unjust attack.

Brief remarks with regard to the anticipated effect of this scheme were made by Hugh Kimball of Oakland, S. A. Hamilton, L. R. Boynton, H. C. Reid, Mr. King, W. S. Berry, Mr. Lewis of Fresno, A. L. Youngholm and R. D. Holabird.

The meeting was brought to a close at a late hour by a rising vote of thanks to W. L. Goodwin and S. V. Walton, who had been instrumental in perfecting the consumption of this plan.

INDUSTRIAL

THE ELECTRIC TRACTOR IN SAWMILL SERVICE.

An interesting example of the application of the electric vehicle to industrial service is afforded by the use of the storage battery tractor in lumber mills and yards. The accompanying illustration shows a tractor in service in the mill of the St. Paul & Tacoma Lumber Company at Tacoma, Wash., for whom E. J. Barry is engineer. This tractor was

G. V. Tractor in Service at St. Paul & Tacoma Lumber Co. Mill.

built by the General Vehicle Company and is equipped with Edison storage batteries.

The tractor is designed to replace mules hauling lumber and gives a draw-bar pull of 2500 lb. Its short wheelbase enables it to turn within a 7 ft. radius, thus making it possible for it to operate in close places.

Comparative costs of operation in a typical mill show the following figures:

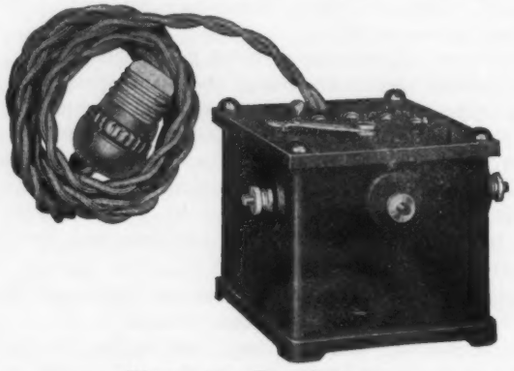
	Mules.	Tractors.
Investment.		
16 mules at $225 each	$3,600.00	
16 sets of harness at $25 each	400.00	
16 one-mule, two-wheel dollies at $25	400.00	
3 Electric Tractors with Edison batteries.		$11,400.00
Stable, corral, shoeing shop, etc.	3,000.00	
Garage, motor-generator set, tools, etc.		1,000.00
Total	$7,400.00	$12,400.00
Fixed Charges.		
Interest	$ 296.00	$ 342.00
Depreciation	1,110.00	544.80
Fire insurance	90.00	114.00
Total	$1,496.00	$1,000.80
Yearly Operating Costs.		
Renewal of batteries once in 10 years.		$ 692.00
Renewal of tires		600.00
Feed, shoeing, stable help, etc., at $20 per month per mule (16 mules)	$ 3,840.00	
Labor	10,500.00	3,600.00
Renewal of chains, gears, etc.		375.00
Repairs of tramways	8,550.00	4,275.00
Total operating costs, per year	$22,890.00	$ 9,542.00
Total costs, per year	$24,386.00	$10,542.80
Yearly saving		$13,843.20

The tractor has a further advantage in that its rubber tires eliminate the necessity of constantly repairing tramways, an expensive item with mules. The tractor has a speed of from 10 to 12 miles per hour, and a specified mileage capacity of 35 to 40 miles on level wooden tramways without load. The St. Paul & Tacoma Lumber Company is contemplating the equipment of its plant with these electric "mules" solely.

WAYNE TOY TRANSFORMERS.

The Wayne Toy Transformer is a medium through which electricity at low voltage may be obtained from an alternating current lighting circuit for operation of electrical toys, such as railways, locomotives, aeroplanes, motors, or any electrical toys which may be operated from alternating current. On account of the numerous sizes of toys it is necessary to have a wide variation in secondary voltage because the smaller toys take from 4 to 10 volts and the larger toys from 10 to 24 volts.

On these transformers the variation in voltage is accomplished by means of three terminals and a switch with a number of contacts. The different voltages are thus made available with only one change in the secondary connections.



Wayne Toy Transformer.

The flexibility of the voltage control not only permits of the operation of practically all the various electrical toys, but permits operating them at variable speeds. The transformer is finished in black with bronze switch mechanism. Wayne Toy Transformers are manufactured by the Fort Wayne Electric Works of the General Electric Company.

BIG POWER CONTRACT AWARDED TO THE SOUTHERN SIERRAS POWER COMPANY.

The Southwestern Portland Cement Company has entered into a contract with the Southern Sierras Power Company to furnish them electric energy for all their requirements at their new plant located at Victorville 2000 horsepower per year for twenty years.

The daily capacity of the new plant will be two thousand barrels. L. D. Gilbert, chief engineer of the Southwestern Portland Cement Company, designed the plant, which is to be the most modern of its kind in existence.

This plant is located four miles from the Golden State Portland Cement Company of Oro Grande, which is also operated by electricity furnished by the Southern Sierras Power Company with a connected load of 1500 horsepower.

NEWS NOTES

INCORPORATIONS.

OLYMPIA, WASH.—The Pierce County Light & Power Company has filed articles of incorporation, with capital stock of $100,000, by F. L. Van Nice, Hiram Davis and W. H. Pringle.

SALEM, ORE.—The North Coast Power Company of Vancouver, Wash., has filed its declaration of intention to engage in business in this state. Its capital is $1,750,000, and it has taken over the properties of the Washington & Oregon Utilities Company.

PHOENIX, ARIZ.—The Whyman Land & Development Company has been incorporated by Richard, Horatio and Robert Whyman. The purpose is to develop water in the Casa Grande district. A contract has been entered into by the company for the construction of a small pumping plant near Higley which will furnish a flow of 360 inches for about 960 acres.

FINANCIAL.

MIAMI, ARIZ.—The town council has decided to call an election on December 14th to determine whether or not a bond issue totaling $228,000 is to be voted for various purposes. The object of the issue is as follows: $17,500 for street improvements and bridge; $18,000 for municipal ice plant; $12,500 for municipal gas plant; $60,000 for sewerage system and disposal plant; $80,000 for water bearing ground, pumps, motors, pipe, etc; $40,000 for municipal plant. The bonds, if issued, are to bear 5 per cent interest, in denominations of $500 and $1000, payable semi-annually.

ILLUMINATION.

ARTESIA, CAL.—A contract for lighting of the streets of this city has been let to the Pacific Light & Power Company.

NEWPORT, CAL.—The board of trustees has decided to call a bond election for $30,000 to install a gas distributing system.

LOS ANGELES, CAL.—The contract for installing and maintaining a lighting system in the Rivera lighting district has been awarded to the Southern California Edison Company.

TROPICO, CAL.—The trustees have adopted a resolution of intention ordering 32 cast iron lighting posts, together with concrete foundations, wires, etc., installed along San Fernando boulevard.

ANAHEIM, CAL.—An effort is being made in Anaheim to extended the system of ornamental lights. It is believed that property owners on North and South Los Angeles and East Center are ready to sign up.

PASADENA, CAL.—The city commission has awarded a contract for the construction and installation of ornamental iron lighting posts on Fair Oaks avenue to the Keystone Iron Works for $1988.

PASADENA, CAL.—The city commission has adopted resolutions of intention ordering the construction and installation of posts, conduits, wires, etc., for lighting Colorado street and Raymond avenue.

BAKERSFIELD, CAL.—Application has been made by C. B. Colby for a franchise to lay pipes, etc., for transmitting power in the highways of Kern county. Sealed bids will be received up to December 8th for the franchise.

HUNTINGTON BEACH, CAL.—At a recent meeting of the city trustees a resolution was presented for the purpose of calling a bond election for $20,000 to install a gas distributing system in Huntington Beach.

MANHATTAN, CAL.—The trustees have adopted a resolution ordering the installation of twenty-three 40-watt tungsten lights, with fixtures, etc., on the Speedway between the southerly city limits and the southerly line of Twenty-third street, and electric current furnished.

FRESNO, CAL.—The board of trustees has adopted a resolution of intention for the construction of an electrolier street lighting system upon each side of J street from the northwest line of Merced street to the southeast line of Tuolumne street and upon the southeast side of Tuolumne street from the southwest line of J street to the northeast line of I street.

TRANSPORTATION.

CLARKSTON, WASH.—The county commissioners have granted a franchise to the Lewiston-Clarkston Transit Company for the extension of the car line.

BAKER CITY, ORE.—The Commercial Club has endorsed the project of J. L. Soule to introduce a street car service in Baker by recommending to the city commissioners the passage of an ordinance which will permit Mr. Soule to place his service in operation without the necessity of a franchise.

TRANSMISSION.

YUMA, ARIZ.—The Arizona Power Company is to build another electric plant along Fossil Creek.

MOSCOW, IDAHO.—An electric franchise has been granted to A. V. Dunkle and the work is now under way.

IONE, ORE.—The Heppner Electric Company is to furnish power after December 1st and the city will be rewired.

EUGENE, ORE.—Waterville, 15 miles from this city, to secure power from here and install services for electric light and power; poles are to be put up.

PRAIRIE CITY, ORE.—The machinery for the new hydroelectric plant of the Prairie Power Company has been ordered and work will be started at once on the extension of the line of the company to Canyon City and John Day.

AUBURN, CAL.—The preliminary work of making camps, etc., along the line of ditch work will soon be commenced by the Pacific Gas & Electric Company, between Colfax and Auburn. The largest camps will be at Clipper Gap and near Auburn. Power plants will be established at both places.

LAPINE, ORE.—The Pringle Falls Water & Power Company of Lapine, with head offices in Portland, has been sold to a syndicate of eastern capitalists headed by Tomes Brothers of Nebraska. The company plans to supply power for the irrigation of the entire Lapine basin and Eden Coulee, Silver Lake and Fort Rock valleys. Power and light for Lapine will also be among the first steps in development. The power plant, which is practically finished, will be immediately equipped.

LOS ANGELES, CAL.—Plans and specifications are to be prepared immediately by Architect F. L. Roehrig for the $50,000 central power station to receive aqueduct electric power for distribution here. The public service commission was notified at the same time that the power from the city's first power unit would be received in Los Angeles in about nine months. The central power station will be built on city property just south of the Main street bridge. The site is on a block plot, giving access to the transmission lines that will come in from the river bed. The sale of the power bonds, it was stated by the commissioners, would enable the city to rush the work.

ALPHABETICAL INDEX TO ADVERTISERS

The letter and number before each name are used in the classified page following

A-1 American Ever-Ready Works of National Carbon Co.... Los Angeles; 755 Folsom Street, San Francisco. Seattle.

A-2 Atchison, Topeka & Santa Fe Railway Co..... 673 Market St., San Francisco; 1218 Broadway, Oakland.

B-1 Baker-Joslyn Company ..... 5 171 New Montgomery St., San Francisco.

B-2 Benjamin Electric Manufacturing Co..... 590 Howard Street, San Francisco

B-5 Bridgeport Brass Co..... 4 (See Pierson, Roeding & Co.)

B-7 Busch-Sulzer Bros.-Diesel Engine Co..... 11 Rialto Bldg., San Francisco.

C-1 Century Electric Co..... 3 906 So. Hope Street, Los Angeles; 56 Natoma Street, San Francisco; 65 Front St., Portland, Ore.

C-3 Crocker-Wheeler Co..... Salt Lake City; Crossley Bldg., 618 Mission St., San Francisco; Seattle.

C-4 Cutler-Hammer Manufacturing Co..... 579 Howard Street, San Francisco; Morgan Bldg., Portland, Ore.; San Fernando Bldg., Los Angeles.

D-1 D. & W. Fuse Co..... Western Electric Co.

D-4 Davis Slate & Manufacturing Co..... 4 Chicago, Ill.

D-2 Dearborn Drug and Chemical Works..... 11 355 East Second Street, Los Angeles; 301 Front Street, San Francisco.

D-3 Dover Manufacturing Co..... Canal Dover, Ohio.

E-1 Edison Lamp Works of General Electric Co..... 10 Rialto Bldg., San Francisco; 724 So. Spring Street, Los Angeles.

E-2 Edison Storage Battery Supply Co..... 11 441 Golden Gate Avenue, San Francisco.

E-3 Electric Agencies Co..... 247 Minna Street, San Francisco; Central Building, Los Angeles.

E-4 Electric Storage Battery Co..... Pacific Electric Bldg., Los Angeles; Spalding Bldg., Portland; 118 New Montgomery Street, San Francisco; Colman Bldg., Seattle

E-5 Electric, Railway & Manufacturers Supply Co..... 84 Second Street, San Francisco.

F-1 Fairbanks, Morse & Co..... Los Angeles; Portland; 651 Mission Street, San Francisco; Seattle; Spokane.

F-3 Federal Sign System (Electric)..... 618 Mission Street, San Francisco.

G-1 General Electric Co..... 10 724 So. Spring Street, Los Angeles; Worcester Bldg., Portland; Rialto Bldg., San Francisco; Colman Bldg., Seattle; Paulsen Bldg., Spokane.

G-2 General Vehicle Co..... 1117 Van Ness Avenue, San Francisco; 331 Wall Street, Los Angeles; British Columbia Electric Ry., Ltd., Vancouver, B. C.

H-1 Habirshaw Wire Co..... 3 (See Western Electric Company.)

H-2 Hemingray Glass Co..... 4 330 So. L. A. Street, Los Angeles; 345 Oak Street, Portland; 807 Mission Street, San Francisco.

H-5 Hunt, Mirk & Co..... 141 Second Street, San Francisco.

H-7 Hurley Machine Co..... New York and Chicago.

I-1 Indiana Rubber and Insulated Wire Co..... 2 Fobes Supply Co., Portland and Seattle.

K-1 Kellogg Switchboard and Supply Co..... Aronson Bldg., San Francisco.

K-2 M. W. Kellogg Co..... (See Pierson, Roeding & Co.)

L-1 Leahy Manufacturing Co..... Eighth and Alameda Street, Los Angeles.

L-2 Locke Insulator Manufacturing Co..... 4 (See Pierson, Roeding & Co.)

M-2 McGlauflin Manufacturing Co..... Sunnyvale, Cal.

M-4 Morse Chain Co..... Monadnock Bldg., San Francisco.

M-3 Moore & Co., Charles C..... 3 Van Nuys Bldg., Los Angeles; Spalding Bldg., Portland; Kearns Bldg., Salt Lake City; Sheldon Bldg., San Francisco; Mutual Life Bldg., Seattle; Santa Rita Hotel Bldg., Tucson.

N-1 Nason & Co., R. N..... 151 Potrero Avenue, San Francisco.

N-2 National Conduit & Cable Co., The..... Trust and Savings Bldg., Los Angeels; Rialto Bldg., San Francisco.

N-3 National Lamp Works of G. E. Co..... (All Jobbers.)

N-4 New York Insulated Wire Co..... 629 Howard Street, San Francisco.

N-5 Northwestern Pacific Railroad..... 11 808 Phelan Bldg., San Francisco.

O-1 Okonite Co. (The) ..... 12 (All Jobbers.)

P-1 Pacific Electric Manufacturing Co..... 80 Tehama Street, San Francisco.

P-2 Pacific States Electric Co..... 2 236-240 So. L. A. Street, Los Angeles; 90 Seventh Street, Portland; 200-210 12th Street, Oakland; 575 Mission Street, San Francisco; 307 First Avenue, So., Seattle.

P-4 Pelton Water Wheel Co..... 11 2219 Harrison Street, San Francisco.

P-5 Pierson, Roeding & Co..... 4 Pacific Electric Bldg., Los Angeles; Rialto Bldg., San Francisco; Colman Bldg., Seattle.

P-7 Pittsburgh Piping & Equipment Co..... 12 Monadnock Bldg., San Francisco.

S-1 Schaw-Batcher Company, Pipe Works, The..... 211 J Street, Sacramento; 356 Market Street, San Francisco.

S-3 Simplex Electric Heating Co..... 12 612 Howard Street, San Francisco.

S-4 Southern Pacific Co..... 2 Flood Bldg., San Francisco.

S-5 Sprague Electric Works..... 4 Rialto Bldg, San Francisco; Colman Bldg.; Seattle; 124 West 4th Street, Los Angeles; Electric Bldg., Portland; Paulsen Bldg., Spokane.

S-6 Standard Underground Cable Co..... 3 First National Bank Bldg., San Francisco; Hibernian Bldg., Los Angeles; Yeon Bldg., Portland; Central Bldg., Seattle, Wash.

T-1 Thomas & Co., R..... 12 (See Western Electric Co.)

T-2 Tubular Woven Fabric Company..... 5 Pawtucket, R. I.

W-2 Western Electric Co..... Eighth and Santee Streets, Los Angeles; 1901 Telegraph Avenue, Oakland, Cal.; 680 Folsom Street, San Francisco; 907 First Avenue, Seattle; 45 North Fifth Street, Portland, Ore.

W-4 Westinghouse Electric and Manufacturing Co..... 6 50-52 East Broadway, Butte; Van Nuys Bldg., Los Angeles; Couch Bldg., Portland; 212 So. W. Temple, Salt Lake City; 165 Second Street, San Francisco, Second and Cherry Streets, Seattle; Paulsen Bldg., Spokane.

W-5 Westinghouse Machine Co..... 141 Second Street, San Francisco.

W-6 Westinghouse Lamp Co..... (See Westinghouse Electric and Manufacturing Co.)

W-8 Western Pipe & Steel Co..... 444 Market Street, San Francisco; 1758 North Broadway, Los Angeles.